

REMARKS

Review and reconsideration on the merits are requested.

Status of Application

Claims 1-5 were pending. Claims 6-8 are newly added.

Formalities

Applicants appreciate the Examiner acknowledging receipt of the priority papers (there is one priority document) and returning two initialed PTO/SB/08.

Specification

The specification is corrected at the points the Examiner has noted.

Claim Objections

In claims 1 and 5, cupper is changed to copper.

Withdrawal of the objections is requested.

Miscellaneous

In the following discussion, the term dilatation “has the same meaning as “expansion”.
See the specification at page 5, lines 21-27.

Applicants have noted that the term “phosphor” is used in the specification. If the Examiner feels that “phosphorus” would be more correct, the Examiner is requested to contact the undersigned.

The Prior Art

WO 02/083966A1 Beguinot et al (Beguinot)

The Rejection

Claims 1-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Beguinot.

The Examiner's reading of Beguinot and application of the claims to Beguinot as set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

Traversal

Beguinot fails to disclose or suggest the objective of the present invention, does not suggest the compositional limits of the claims of the present application as the Beguinot composition is based on a different technical concept from that of the present invention and the composition of the present invention as claimed results in different advantages from the composition of Beguinot. Accordingly, Applicants respectfully submit that one of ordinary skill in the art would not be led to the present invention nor find the claims as framed obvious over Beguinot.

As a starting point, Beguinot is silent on the effect of the present invention of "excellent in characteristics of suppressant dimensional change". Beguinot simply discloses that "the structure is most homogenous possible in great thickness after hardening".¹ The "homogenous structure" of Beguinot means that Beguinot intends to reduce coarse carbides and to disperse fine carbides, whereby toughness is improved while keeping high hardness. Applicants advise that this occurs in the French text at page 2, lines 8 to 10. Applicants have reviewed the published French text of Beguinot from WIPO, and largely provide the following comments based on the French text.

Beguinot discloses, as prior art, that carbon and chromium are reduced, respectively, to 1% and 8% to reduce coarse carbides, and 2.5% of Mo is added to keep high hardness by

¹ Applicants advise that this occurs at page 1, lines 19-21 in the French text published by WIPO.

precipitating hard carbides. French text, page 2, lines 1-7. As shown in Table 1 of Beguinot, heat (Coulee) 1, having the composition proposed by Beguinot has substantially the same content of carbon and chromium as heat 2 which is a prior art heat. Thus, the example in the Table in Beguinot has a composition in which Ti, Zr and N are adjusted on the basis of the composition of the prior art that contains about 1% of carbon, about 8% of chromium and about 2.5% of molybdenum. This can be seen from the statements at pages 1 and 2 in Beguinot.

In distinction to Beguinot, as stated in the paragraph bridging pages 2/3 of the present application, the objective of the present invention *is to suppress expansion in tempering a steel*. The expansion is caused by a release of residual stress introduced in hardening. The release of the residual stress (or decomposition of austenite) is facilitated by Mo. Mo is added to a steel in the prior art, such as Beguinot, to obtain a secondary hardening by way of forming carbides. Thus, the amount of Mo must be limited to not higher than 1.7% in the formula $\text{Mo} + \text{W}/2$ in the present invention.

Further, since the present invention has the further object of improving machinability, for example, see the bottom of page 6 of the specification, initially carbides are reduced. In order to compensate for the reduction in hardness due to the reduction in the carbides, not less than 0.3% of Ni and not less than 0.1% of Al are added to the steel. This is because adding a substantial amount of Mo cannot be practiced in the present invention. The added Ni and Al form an Ni-Al intermetallic compound to provide the steel with hardness, as well as providing an effect of causing a contractional change in dimensions, canceling the above described dilatation.

Although claim 1 of Beguinot recites that the steel contains 1 to 4% of $\text{Mo} + \text{W}/2$, Beguinot does not disclose or suggest limiting the content thereof to not more than 1.7%. The reason for this is that Beguinot fails to disclose or deal with the object of suppressing dilatation

of the steel after hardening and tempering. The Examiner is requested to note in this regard that the Example in Beguinot involves the use 2.5% of Mo.

Although Beguinot defines $\text{Si} + \text{Al}$ as ≤ 2 , these elements are merely added for the purpose of deoxidation. See page 5, lines 14-18 in Beguinot. Thus, one of ordinary skill in the art would want the content of these two materials to be as low as possible. As a consequence, this limitation in Beguinot appears to be simply a broad, hypothetical range, and Si and Al are not positively added for any effect other than deoxidation. Table 1 in Beguinot shows that heat 1 contains 0.03% Al. As a consequence, Applicants respectfully submit that one of ordinary skill in the art would not contemplate increasing the amount of Al to “0.1 to 0.7%” as claimed in the present claims. This is certainly the case following the teaching of Beguinot where one could successfully reduce the amount to 0.03%. Thus, Applicants respectfully submit that Beguinot does not suggest the range of Al should or must be “0.1 to 0.7%”.

Although Beguinot discloses that not more than 0.3% of sulfur can be added to the steel in order to improve machinability (page 5, lines 29 and 30), in Beguinot sulfur would be considered an impurity because heat 1 in Table 1 of Beguinot does not contain sulfur. Further, sulfur is generally an impurity in the technical art of tool steels. It would not be practical or understood by one of ordinary skill in the art that one should add 0.01 to 0.12% sulfur. The present invention has as an object obtaining a machinable steel, and this is the reason that sulfur is added in the above range.

Referring now specifically to claim 2 of the present application, claim 2 recites that $\text{Ni}/\text{Al} = 1$ to 3.7. Aluminum and nickel are coupled to form an Ni-Al intermetallic compound in the present invention. If the amounts of nickel and aluminum are adjusted so as to satisfy the relationship of $\text{Ni}/\text{Al} = 1$ to 3.7, the amounts of nickel and aluminum in the matrix which do not

form an intermetallic compound can be adjusted. Thus, the amount of nickel in the matrix can be reduced, particularly after the intermetallic compound has been precipitated, so that the steel can keep good machinability after heat treatment (aging), and undergo secondary hardening through precipitation.

Beguinet et al fail to disclose that a Ni-Al intermetallic compound is formed, and thus cannot teach or suggest to one of ordinary skill in the art the claimed relationship between nickel and aluminum.

Considering all of the above, withdrawal of the rejection and allowance is requested.

Basis for New Claims

In claim 6, basis for the amounts occurs at:

(C), page 10, line 11;

(Si), page 10, lines 24/25;

(Mn), page 11, line 3.

(P), page 15, line 5;

(S), page 14, lines 17/18;

(Cr), page 11, line 16;

(Mo+(W/2)), page 12, line 8;

(V), page 15, line 9;

(Ni), page 13, lines 10/11;

(Cu), page 14, lines 11/12;

(Al), page 12, line 23;

(Nb), page 14, lines 24/25;

(Ni/Al), page 13, line 21; and

(Cr x C) amounts, page 8, line 15-18.

Claim 7 at page 13, lines 21/22.

Claim 8 at page 12, line 23

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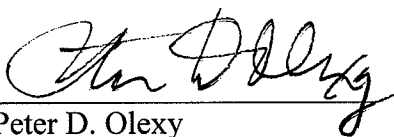
Respectfully submitted,

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

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CUSTOMER NUMBER


Peter D. Olexy
Registration No. 24,513

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